DETAILED ACTION

1. This office action is written in reply to applicant's correspondence filed July 16, 2008. Claims 1, 10, 13 and 14 were amended and claims 2, 3 and 9 were cancelled.

2. Claims 1, 4-8 and 10-20 are pending and claims 1, 4-8 and 10-15 are under prosecution.

Claim Objections

3. Previous objections to claims 10-15 were withdrawn in view of claim amendments.

Amendments to Claims

4. Amendments to the claims 1, 10, 13 and 14 have been reviewed and entered.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 7, 8 and 14-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claim 7 recites the limitation of "<u>the</u> thin film light source" in line 1. There is insufficient antecedent basis for this limitation in the claim 4. It is suggested that the

claim be amended properly to depend from the “light source” or “thin film semiconductor” of claim 4.

8. Claim 8 recites the limitation of "the thin film photodetector" in line 1. There is insufficient antecedent basis for this limitation in the claim 4. It is suggested that the claim be amended properly to depend from the “photodetector” or “thin film semiconductor” of claim 4.

9. Claim 14 recites the limitation "comprises a further plurality of electrodes" in line 2. There is insufficient antecedent basis for this limitation because claim 1 does not recite an electrode. It is suggested that the claim be amended, e.g. “biochip further comprises a plurality of electrodes” to provide proper antecedent basis.

10. Claim 15 is indefinite because it is dependent from claim 14.

Claim Interpretation

35 U.S.C. 112, sixth paragraph

11. Claims 1 and 10-13 are written using means-plus- function language. The M PEP § 2181-2184 provides guidance for claim evaluation and examination under 35 U.S.C. 112, Sixth Paragraph as set forth below:

The USPTO must apply 35 U.S.C. 112, sixth paragraph in appropriate cases, and give claims their broadest reasonable interpretation, in light of and consistent with the written description of the invention in the application. See Donaldson, 16 F.3d at 1194, and 29 USPQ2d at 1850 (stating that 35 U.S.C. 112, sixth paragraph “merely sets a limit on how broadly the PTO may construe means-plus-function language under the

rubric of reasonable interpretation". The Federal Circuit has held that applicants (and reexamination patentees) before the USPTO have the opportunity and the obligation to define their inventions precisely during proceedings before the PTO. See In re Morris, 127 F.3d 1048, 1056-57, 44 USPQ2d 1023, 1029-30 (Fed. Cir. 1997).

> A claim limitation will be presumed to invoke 35 U.S.C. 112, sixth paragraph, if it meets the following 3-prong analysis:
> (A) the claim limitations must use the phrase "means for" or "step for; "
> (B) the "means for" or "step for" must be modified by functional language; and
> (C) the phrase "means for" or "step for" must not be modified by sufficient structure, material, or acts for achieving the specified function. (see MPEP § 2181(I)).

12. The limitation of "means for determining a specific binding event at each binding site" in claim 1 (lines 2 and 6-7), is not being treated under 35 USC 112, sixth paragraph because the claim does not meet the third prong of the 3-prong analysis because "means" is defined by structure, i.e., light source and photodetector and planar waveguide. Therefore, means will be given broadest reasonable interpretation.

13. The limitation "means for determining a refractive index change" in claim 10, line 2 is being treated under 35 USC 112, sixth paragraph as it meets the 3-prong analysis. Therefore, "means" is interpreted to encompass the means as described in the specification (e.g., pg. 17, lines 28-34) or functional equivalents of first and second planar waveguide.

14. The limitation of "means for determining a refractive index change" in claims 11 and 12, is not being treated under 35 USC 112, sixth paragraph because the claim does not meet the third prong of the 3-prong analysis because "means" is defined by structure, i.e., first and second planar waveguide. Therefore, means will be given broadest reasonable interpretation.

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. Claims 1 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Obremski et al (USPN 6,110,749 issued Aug. 29, 2000) in view of Duveneck et al (USPN 6,395,558 issued May 28, 2002).

Claim 1 recites following structural features: a) a plurality of binding sites with monolithically integrated with optical means, b) a light source, c) a photodetector and d) a planar waveguide. Obremski et al teaches all the structural features except for the integration of optical means with the binding sites, which is taught by Duveneck et al as described below.

Regarding structural components ‘a’ and ‘d’, Obremski et al teaches a biochip for testing biological substances comprising a plurality of binding sites (Fig. 1, # 22, column 4, line 1) on a planar waveguide (Fig. 1, # 24, column 4, line 2).

Obremski et al also teaches a light source (Fig. 5, # 38, column 12, line 11, structural component ‘b’) and a photodetector (Fig. 5, # 64, column 14, line 14, structural component ‘c’), which are optical means for determining a specific binding event at each binding sites. Obremski et al also teaches an evanescent field of light propagating in the waveguide interacting with the biological substance under test (Fig.

5, # 30, column 10, lines 19-27). Obremski et al are silent about monolithic integration of light source and photodetector at the binding site.

Regarding claim 10, Obremski et al teaches a planar waveguide (Fig. 2, # 24) and another layer (Fig. 2, # 32) with modified refractive index (Fig. 2, # 32, column 9, lines 63-67 and column 10, lines 13-14) and further teaches evanescent means for determining a binding event at each specific site (abstract). Obremski et al are silent about first and second planar waveguides as means for determining a refractive index change associated with a binding event.

Regarding claims 11 and 12, Obremski et al are silent about first and second planar waveguide separated by coupling layer and the second planar waveguide comprising grating.

Regarding claim 13, Obremski et al teaches a light path on the probe with the target and without target (column 2, lines 29-35) and the light path without the target is the reference light path as defined in the instant specification (instant specification, pg. 20, line 1). It is noted that “for error correction” is a recitation of the intended use.

Regarding claim 1, Obremski et al are silent about monolithic integration of light source and detector with binding sites.

Regarding claims 11 and 12, Obremski et al are silent about first and second planar waveguide separated by coupling layer and the second planar waveguide comprising grating.

However, monolithic integration of light source and detector with binding sites and separation of first and second planar waveguides by a coupling layer, wherein the

second planar waveguide comprises grating were known in the art at the time of the claimed invention was made as taught by Duveneck et al.

Duveneck et al teaches a biochip for testing biological substance comprising a planar sensor containing transducer and recognition layer (Fig. 1, # c) and further teaches transducer consists of a substrate (Fig. 1, # a), an intermediate layer, a waveguide layer (Fig. 1, # b) and an adhesion promoting layer (column 2, lines 14-23 and lines 56-57). Duveneck et al also teaches both the light source and the detector are monolithically integrated into the sensor platform, i.e., binding sites (column 3, lines 66-67) thus teaching binding sites are monolithically integrated with the optical means.

Duveneck et al explicitly teaches that the first planar waveguide and second planar waveguide separated by coupling layer (column 7, lines 11-16) and a means for determining the refractive index changes associated with a binding event (column 2, lines 60-65, limitations of instant claims 10 and 11).

Duveneck et al also teaches that the grating is formed on the first wave guide (column 3, lines 5-8) and further teaches a second planar wave guide located below the first wave guide and separated by coupling layer of lower refractive index than that of the two waveguides (column 7, lines 11-16), thus teaching a means for determining the refractive index changes associated with a binding event as claimed (column 2, lines 60-65, limitations of instant claim 12).

Duveneck et al also teaches monolithic integration of optical means with the binding site provides higher signal stability without any background interfering signals (column 4, lines 2-12).

Monolithic integration of optical source at each binding sites to increase the signal stability without interference of the background signal taught by Duveneck et al in the device of Obremski et al for increasing the sensitivity from the small amount of sample (Obremski et al, column 1, lines 22-27).

It would have been prima facie obvious to one having the ordinary skill in the art at the time of the claimed invention was made to modify the optical means of detection of Obremski et al with the monolithic integration of optical means at the binding site of Duveneck et al with a reasonable expectation of success with the expected benefit of providing higher signal stability without any background interfering signals as taught by Duveneck et al (column 4, lines 2-12).

17. Claims 1 and 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Obremski et al (USPN 6,110,749 issued Aug. 29, 2000) in view of Duveneck et al (USPN 6,395,558 issued May 28, 2002) as applied to claim 1 as above and further in view of Sickmiller (USPN 6,214,733 issued Apr. 10, 2001).

Teachings of Obremski et al and Duveneck et al regarding claim 1 are described in section 18 of this office action.

Regarding claims 4 and 5, Duveneck et al teaches that light source and detector are integrated into the sensor platform (column 3, lines 66-67).

Regarding claim 6, Obremski et al and Duveneck et al are silent about semiconductor thin film comprises semiconductor polymer.

Obremski et al and Duveneck et al are silent about substrate comprising a thin film semiconductor. However, thin film semiconductor was known in the art at the time of the claimed invention was made as taught by Sickmiller.

Sickmiller teaches a device comprising thin film semiconductor (Fig. 1, device # 10, thin film semiconductor # 12, column 2, and line 54) and further teaches that light source and transistors, i.e., photodetector are implemented in thin film conductor (column 2, lines 65-67). Sickmiller also teaches semiconductor thin film material comprises polymer (column 2, line 9). Sickmiller also teaches that thin film semiconductor is mechanically flexible and increases optical efficiency of opto-electronic devices and increased electrical performances of semiconductor devices (column 9, lines 49-56).

It would have been prima facie obvious to one having the ordinary skill in the art at the time of the claimed invention was made to modify the optical means of Obremski et al and Duveneck et al with the thin film semiconductor optical means of Sickmiller with a reasonable expectation of success with the expected benefit of mechanical flexibility and increased optical efficiency and increased electrical performances as taught by Sickmiller (column 9, lines 49-56).

18. Claims 1, 4 and 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Obremski et al (USPN 6,110,749 issued Aug. 29, 2000), Duveneck et al (USPN 6,395,558 issued May 28, 2002) Sickmiller (USPN 6,214,733 issued Apr. 10, 2001) as

applied to claims 1 and 4 as above and further in view of Little et al (USPGPUB NO. 2004/0101861 filed Nov. 17, 2002).

Teachings of Obremski et al, Duveneck et al and Sickmiller regarding claims 1 and 4 are described in section 18 and 19 of this office action.

Regarding claims 7 and 8, Duveneck et al teaches the light source and photodetector (column 3, lines 66-67). Obremski et al, Duveneck et al and Sickmiller are silent about thin film light source and thin film photodetector are microcavity light source and photodetector. However, microcavity light source and microcavity photodetector were known in the art at the time of the claimed invention was made as taught by Little et al.

Little et al teaches that the thin film light source is a resonant cavity, i.e., a microcavity light source (Fig. 5A, # 58, paragraphs 0050-0053) and further teaches that the thin film photodetector is a resonant cavity, i.e., a microcavity photodetector (Fig. 5A, # 60, paragraphs 0050-0053). Little et al also teaches that microcavity light source and photodetectors provides a means for efficient optical detection at the microlocations on the substrate and enhances the detection sensitivity (paragraphs 0013 and 0035).

It would have been prima facie obvious to one having the ordinary skill in the art at the time of the claimed invention was made to modify the light source and photodetector of Obremski et al, Duveneck et al and Sickmiller with the thin film microcavity light source and photodetector of Little et al with a reasonable expectation of success with the expected benefit of having microcavity light source and photodetectors providing a means for efficient optical detection at the microlocations on

the substrate and enhancing the detection sensitivity as taught by Little et al (paragraphs 0013 and 0035).

19. Claims 1 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Obremski et al (USPN 6,110,749 issued Aug. 29, 2000) in view of Duveneck et al (USPN 6,395,558 issued May 28, 2002) as applied to claims 1 as above and further in view of McFarland et al (USPGPUB NO. 2003/0104481 published Jun. 5, 2003).

Regarding claims 14 and 15, Obremski et al teaches a planar waveguide device comprising a plurality of location on the surface comprising nucleic acid probe and further teaches detection of target by hybridization to the probe (column 4, lines 4-10 and column 7, lines 39-47). Obremski et al and Duveneck et al are silent about a plurality of electrodes at each binding site to control the hybridization.

However, a plurality of electrodes at a binding site was known in the art at the time of the claimed invention was made as taught by McFarland et al, who teaches an apparatus comprising a substrate comprising a plurality of electrodes (paragraph 0044) for controlling hybridization condition at each binding site (paragraph 0064). McFarland et al also teaches electrodes comprise resistive heater electrode formed underneath binding sites (Fig. 5, # 505, paragraphs 0054 and 0071-0072). McFarland et al also teaches that the electrodes provides a means for generating addressable arrays of compounds varying in composition concentration, stoichiometry and thickness and for controlling reaction and hybridization (paragraphs 0010 and 0011).

It would have been prima facie obvious to one having the ordinary skill in the art at the time of the claimed invention was made to modify the substrate of Obremski et al and Duveneck et al with the substrate comprising electrode of McFarland et al with a reasonable expectation of success with the expected benefit of having heat resistive electrodes for generating addressable arrays of compounds varying in composition concentration, stoichiometry and thickness and for controlling reaction and hybridization as taught by McFarland et al (paragraphs 0010 and 0011).

Response to remarks from the Applicants

Claim Rejections under 35 U.S.C. § 102(b)

20. Applicant's arguments with respect to claims 1-9 have been considered but are moot in view of the withdrawal of the previous rejections and new grounds of rejection set forth in this office action.

Conclusion

21. No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Narayan K. Bhat whose telephone number is (571)-272-5540. The examiner can normally be reached on 8.30 am to 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram R. Shukla can be reached on (571)-272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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